CLAIMS

1. A process for the production of a transparent resinous copolymer, the process comprising the sequential steps, in a reaction medium, of:

(a) charging in the presence of an initiator, a first monovinyl-substitued aromatic monomer and contacting it until all the monomer is polymerized;

(b) charging a conjugated diene and allowing the polymerization to occur;

(c) charging a multi-functional deactivation agent to kill a fraction of the living polymer species generated in step (b);

(d) charging a mixture of a second monovinyl-substitued aromatic monomer and a second conjugated diene monomer and allowing polymerization to occurs in the presence of a random distribution agent until all the monomers are consumed; and

(e) recovering the polymer using a terminating agent.

2. The process of claim 1 carried out in the presence of a polar compound added in step (a).

3. A process for the production of a transparent resinous copolymer, the process comprising the sequential steps, in a reaction medium, of:

(a) polymerizing a monovinyl-substitued aromatic monomer (S_1) in a solvent in presence of a polar compound and a initiator (RM) until essentially no unreacted monovinyl-substitued aromatic monomer is left in the so-formed mixture (i) to form at least the species $R\text{-}S_1\text{-}M$;

(b) adding to said mixture (i) a conjugated diene monomer (B_1) and allowing the polymerization to occur until essentially no conjugated diene is left in the so-formed mixture (ii) to form at least the species $R\text{-}S_1\text{-}B_1\text{-}M$;

(c) adding to said mixture (ii) a multi-functional deactivator agent (X) to partially kill the living chains present in the so-formed mixture (iii) to form at least the species $(S_1\text{-}B_1)X$;

(d) adding to said mixture (iii) a mixture of monovinyl-substitued aromatic monomer (S_2) and conjugated diene monomer (B_2) and allowing the copolymerization to occur until essentially no unreacted monomers are left in the so-formed (iv) mixture to form at least the species $R\text{-}S_1\text{-}B_1\text{-}B_2/S_2\text{-}M$; and

(e) recovering the so-formed species $R\text{-}S_1\text{-}B_1\text{-}B_2/S_2\text{-}M$ (v) using a terminating agent.

4. The process of claim 3, in which the ratio $X{:}RM_a$ is comprised between 0,5 and 0,9 of the stoechiometry.

5. The process of claim 3 or 4, in which the ratio $X : RM_a$ is comprised between 0,6 and 0,8 of the stoechiometry.

6. The process of any one of claims 1 to 5, wherein the proportions by weight of the first vinyl aromatic monomer/first conjugated diene monomer/second vinyl aromatic monomer/second conjugated diene monomer

are, in percent based on the total amount of monomers, 5-30/2-20/50-80/5-25, inclusive.

7. The process of any one of claims 1 to 6, wherein the proportions by weight of the first vinyl aromatic monomer/first conjugated diene monomer/second vinyl aromatic monomer/second conjugated diene monomer are, in percent based on the total amount of monomers, 10-25/5-15/55-70/7-20, inclusive.

8. The polymer obtainable by the process of any one of claims 1 to 7.

9. A transparent resinous conjugated diene/vinyl aromatic block copolymer comprising:

(i) a first conjugated diene/monovinyl-substitued aromatic block copolymer, resulting from the partial deactivation by a multi-functional agent of the living species R-S_1-B_1-M wherein S_1 is a monovinyl-substitued vinyl aromatic block, B_1 is a conjugated diene block, RM being an initiator wherein the living species R-S_1-B_1-M has a molecular weight comprised between 10.000 and 50.000 Daltons and a vinyl aromatic content comprised between 40 and 90% by weight; and

(ii) a second conjugated diene/monovinyl-substitued aromatic block copolymer, resulting from the copolymerisation of a conjugated diene B_2/monovinyl-substitued aromatic S_2 monomers mixture in presence of the remaining living species R-S_1-B_1-M to form the species R-S_1-B_1-B_2/S_2-M wherein B_2/S_2 is a tapered block, wherein said species R-S_1-B_1-B_2/S_2-M has a molecular weight comprised between 90.000 Daltons and 300.000 Daltons and a vinyl aromatic content comprised between 60% and 85% by weight.

10. The transparent resinous copolymer of any one of claims 8 to 10, wherein the resinous copolymer comprises from 5 to 40wt% of said first conjugated diene/vinyl aromatic block copolymer.

11. A transparent resinous conjugated diene/vinyl aromatic block copolymer comprising:

(i) a first conjugated diene/vinyl aromatic block copolymer, having a radial structure with chains having a molecular weight comprised between 10,000 and 50,000 and a vinyl aromatic content comprised between 40 and 90% by weight; and

(ii) a second conjugated diene/vinyl aromatic block copolymer, having a tapered structure with chains having a molecular weight comprised between 90,000 and 300,000 daltons and a vinyl aromatic content comprised between 75 and 90% by weight;

the resinous copolymer comprises from 5 to 40wt% of said first blocks; and

the total vinyl aromatic content of the resinous copolymer being comprised between 70 and 85% by weight.

12. The transparent resinous copolymer of any one of claims 8 to 11, wherein the structure of the first copolymer is of the type $(S_1-B_1)X$ where X has n functions where n from 2 to 8.

13. The transparent resinous copolymer of any one of claims 8 to 12, wherein the total vinyl aromatic content is comprised between 75 and 82% by weight.

14. The transparent resinous copolymer of any one of claims 8 to 13, wherein the first conjugated diene/monovinyl-substitued aromatic block has a vinyl aromatic content comprised between 40 and 65% by weight.

15. The transparent resinous copolymer of any one of claims 9 to 14, wherein the molecular weight of the second copolymer chain is comprised between 150,000 and 180,000 daltons.

16. A resinous blend comprising at least one transparent resinous copolymer of any one of claims 8 to 15.

17. A process for manufacturing molded objects comprising the step of injecting the transparent resinous copolymer of any one of claims 8 to 15 or the blend of claim 16.